

FORM PTO-1390 (REV. 1-98)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER 41577/261336
<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371</b>			U.S. APPLICATION NO. (If known, see 37 CFR 1.5) <b>09/889639</b>
INTERNATIONAL APPLICATION NO. PCT/GB00/00210	INTERNATIONAL FILING DATE 25 January 2000 (25.01.00)	PRIORITY DATE CLAIMED 28 January 1999 (28.01.99)	
TITLE OF INVENTION FIRE DETECTION METHOD			
APPLICANT(S) FOR DO/EO/US FOULGER, Brian; RICHES, James; BOLLAN, Hilary Roberta			
<p>Applicants herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information:</p> <ol style="list-style-type: none"> <li><input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</li> <li><input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</li> <li><input type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 37 (b) and PCT Articles 22 and 39(1).</li> <li><input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</li> <li><input checked="" type="checkbox"/> A copy of the International Application as published (35 U.S.C. 371(c)(2))             <ol style="list-style-type: none"> <li><input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</li> <li><input type="checkbox"/> has been transmitted by the International Bureau.</li> <li><input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</li> </ol> </li> <li><input type="checkbox"/> A translation of the published International Application into English (35 U.S.C. 371(c)(2)).</li> <li><input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))             <ol style="list-style-type: none"> <li><input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</li> <li><input type="checkbox"/> have been transmitted by the International Bureau.</li> <li><input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li><input checked="" type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li><input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).</li> <li><input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (unexecuted)</li> <li><input type="checkbox"/> A translation of the International Preliminary Examination Report under PCT Article 36</li> <li><input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.197 and 1.98</li> <li><input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</li> <li><input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</li> <li><input type="checkbox"/> A substitute specification.</li> <li><input type="checkbox"/> A change of power of attorney and/or address letter.</li> <li><input checked="" type="checkbox"/> Other items or information:             <ol style="list-style-type: none"> <li>Certification Under 37 CFR 1.10</li> </ol> <p>I hereby certify that this document is being mailed to Box PCT, Commissioner for Patents, Washington, D.C. 20231, via "Express Mail Post Office to Addressee" on this <u>19th</u> day of July, 2001, Express Mail Label No. EL209598533US</p> <p><u>Angela M. Rossi</u> Angela M. Rossi</p> <ol style="list-style-type: none"> <li>Marked up version of claims as amended</li> <li>International Preliminary Examination Report</li> </ol> </li> </ol>			



U.S. APPLICATION NO. (37 CFR 1.5) <b>09/889639</b>		INTERNATIONAL APPLICATION NO. PCT/GB00/00210		ATTORNEY'S DOCKET NUMBER 41577/261336	
17. <input checked="" type="checkbox"/> The following fees are submitted BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):				CALCULATIONS PTO USE ONLY	
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO				\$1,000.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO				\$860.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO				\$710.00	
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)				\$690.00	
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)				\$100.00	
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$860.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$ .00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	16	00	X \$18.00	\$ .00	
Independent claims	03	00	X \$80.00	\$ .00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$ .00	
TOTAL OF ABOVE CALCULATIONS =				\$860.00	
Applicant claims small entity status.				\$ .00	
SUBTOTAL =				\$860.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$ .00	
TOTAL NATIONAL FEE =				\$860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40 per property				\$ .00	
TOTAL FEES ENCLOSED =				\$860.00	
				Amount to be refunded:	\$
				charged:	\$
<p>a. <input checked="" type="checkbox"/> Check in the amount of \$860.00 is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. 11-0855 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-0855.</p>					
<p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p>					
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John S. Pratt, Esq.				<i>Dean W. Russell</i>	
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PATENT TRADEMARK OFFICE

09/889639



IN THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)

Applicants: Brian FOULGER, James RICHES, and  
Hilary Roberta BOLLAN

International  
Application No.: PCT/GB00/00210

U.S. Serial No.: unknown

International  
Filing Date: 25 January 2000 (25.01.00)

U.S. Filing Date: 19 July 2001 (19.07.01)

For: FIRE DETECTION METHOD

Box PCT  
commissioner for Patents  
Washington, D.C. 20231

Attorney Docket No. 41577/261336  
Date: 19 July 2001

**PRELIMINARY AMENDMENT**

Sir:

Kindly amend the above-identified patent application prior to examination:

In the Claims

3. (Amended) A method according to claim 1 wherein sampling is effected continuously.
4. (Amended) A method according to claim 1 wherein sampling is effected at predetermined time intervals.
5. (Amended) A method according to claim 1 wherein the ion mobility spectrometer is connected to an alarm system.
8. (Amended) A method according to claim 5 wherein the alarm is triggered when a feature characteristic of thermal degradation is detected.
9. (Amended) A method according to claim 1 wherein the ion mobility spectrometer is set to detect volatile material released from an electrical component.



Express Mail Label No. EL209598533US  
U.S.National Phase Entry of PCT/GB00/00210  
"Fire Detection Method"  
Filed: 19 July 2001  
PRELIMINARY AMENDMENT

11. (Amended) Apparatus for detecting a heightened fire risk in an environment using the method as claimed in claim 1.
13. (Amended) An ion mobility spectrometer for use in a method according to claim 1.
14. (Amended) An ion mobility spectrometer when used in a method according to claim 1.

Respectfully submitted,



Dean W. Russell  
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Date: 19 July 2001

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Marked up version of claims

PCT/GB00/00210

3. (Amended) A method according to claim 1 [or claim 2] wherein sampling is effected continuously.
4. (Amended) A method according to claim 1 [or claim 2] wherein sampling is effected at predetermined time intervals.
5. (Amended) A method according to [any one of the preceding claims] claim 1 wherein the ion mobility spectrometer is connected to an alarm system.
8. (Amended) A method according to [any one of claims 5 to 7] claim 5 wherein the alarm is triggered when a feature characteristic of thermal degradation is detected.
9. (Amended) A method according to [any one of the preceding claims] claim 1 wherein the ion mobility spectrometer is set to detect volatile material released from an electrical component.
11. (Amended) Apparatus for detecting a heightened fire risk in an environment using the method as claimed in [any one of claims 1 to 10] claim 1.
13. (Amended) An ion mobility spectrometer for use in a method according to [any one of claims 1 to 10] claim 1.
14. (Amended) An ion mobility spectrometer when used in a method according to [any one of claims 1 to 10] claim 1.



Fire Detection Method

- The present invention relates to a method for the detection of overheating of materials in particular electrical equipment, which precedes the onset of fire, as well as to apparatus for use in the method. Thus the invention is useful in providing advance warning of conditions likely to lead to fire so that preventative action can be taken.
- 10 Early warning fire detectors often rely on the detection of smoke particles to trigger an alarm. At this stage, fire is imminent if not already underway and so it is generally too late for preventative action.
- 15 Methods for the early detection of fire based upon the vapour detection have also been described. These have potential to provide advanced warning of an imminent fire. These chemical sensing techniques are often based on chemical coatings which interact with the outgassing vapours either through a chemical
- 20 reaction (USP 5065140) or adsorption. In the former case, the detector lacks versatility in that it reacts only to the vapour of interest. The latter method lacks specificity and requires considerable signal processing effort.
- 25 Ion mobility spectrometers are well known in the detection of chemical warfare agents, explosives, propellants, and industrial pollutants. The principles by which they operate and the design of spectrometers are described for example by W. Carr (Ed). "Plasma Chromatography", Plenum Press, London,
- 30 1984, and Turner et al., Trends in Analytical Chemistry, 13, 7 (1994) 275-280. In essence, an ion mobility spectrometer consists of an ionisation region coupled to an ion drift tube via a shutter grid. A sample is introduced into the ionisation region together with a carrier gas (such as air),
- 35 for example using a suction pump. In the ionisation region, the carrier gas molecules (as well as any sample) are ionised



by beta radiation from a Ni-63 radioactive source, or other methods such as corona discharge or photoionisation. Reactant ions are produced from the carrier gas (such as air) which react with the sample gas, generally in a complex manner, so as to result in product ions. Under the influence of an applied electric field, reactant and product ions are extracted from the ionisation region into the ion drift region. In the ion drift region, the ions separate due to their different mobilities determined by their size, charge and polarisability. They are collected at a collector electrode where they are neutralised, and so generate an electric current that can be measured. Data is generated at a rapid rate. Repeat scans are suitably averaged to improve the signal to noise ratio.

15

The spectrometer can be arranged to detect either positive or negative ions by reversal of the voltages.

20

The present invention provides a method for detecting gases or vapours emitted from materials under conditions at which there is a risk of the onset of fire, said method comprising sampling gas from the region of the material using an ion mobility spectrometer, detecting the ion peaks of volatilised material.

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The advantages of the use of ion mobility spectrometry in this application are associated with its extreme sensitivity and selectivity. The spectrometer can be pre-set, by controlling the potentials applied to the drift region for example, so as to detect selected target gases which are emitted during outgassing through heating in any specific environment. The selectivity of the device means that it could be applied to a variety of different environments. However, it will be particularly useful in high technology environments, such as data processing and computer facilities, telephone exchanges, space stations, industrial plants especially chemical plants



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There is no need to know or analyse the materials which are emitted, provided it can be ensured that at least some of these fall within the detection range set on the ion mobility spectrometer. This can be done by routine methods. For  
5 example, one or more representative components present in the particular environment to be monitored can be heated under safe test conditions and the signal generated as a result of the emission of material monitored. The detection range of the ion mobility spectrometer can then be adjusted to ensure a  
10 signal is generated under these conditions.

The spectrometer will be pre-set to detect either positive or negative ions depending upon the nature of the signal in each case. Selection of the most sensitive signal in each  
15 particular case can be determined, again by routine methods.

Many solid materials that release volatile material when heated, but in particular are electrical components such as printed circuit boards, resistors and lacquer-coated  
20 materials. The spectrometer will suitably be set to detect vapours emitted from such components.

Available ion mobility spectrometers are convenient to use in that it is small and hand-held. For use in the context of the  
25 invention however, size and portability may be less critical. The spectrometer may be installed in the environment on a permanent basis. It would not, under these circumstances be required to be as robust as a device which is intended, for example to be carried onto a battle-field. This may result in  
30 cost savings in the spectrometer itself.

In a further aspect the invention provides apparatus for detecting a heightened fire risk in an environment using the method as described above.



In particular, the apparatus will comprise an ion mobility spectrometer. The spectrometer is suitably adapted such that it is able to detect increases in the particular gases of\* vapours emitted from materials present in the particular  
5 environment in which it is placed, under conditions at which there is a heightened risk of the onset of fire. In particular, the controls of the device will be pre-set so that they are able to detect specific volatile materials likely to be emitted from materials present in the particular  
10 environment, which presents a potential fire hazard.

The precise settings of the controls of the spectrometer will vary depending upon the particular environment being monitored and can be determined by the skilled person using routine  
15 methods. Typically the electric field applied to the drift tube of the device will be in the range of from 150 to 350V/cm, more usually from 200 to 300V/cm and often at about 250V/cm. The frequency of spectrometer readings necessary to provide a rapid, detectable signal will depend to some extent,  
20 on the ion drift times of the particular volatile materials being detected. Generally, these are less than 20ms, and so spectra may be gathered at the rate of between 40 to 60 Hz, for example at about 50Hz.

25 Thus in a particular embodiment of the invention, there is provided an ion mobility spectrometer for use, or when used, in the method described above.

Yet a further aspect of the invention provides the use of an ion  
30 mobility spectrometer for the detection of a heightened risk of fire in an environment. More particularly, there is provided, the use of an ion mobility spectrometer in the detection of gases or vapours emitted from materials under conditions at which there is a risk of the onset of fire.



The invention will now be particularly described by way of example with reference to the accompanying diagrammatic drawings in which:

- 5 Figure 1 is a schematic diagram of an ion mobility spectrometer;

Figure 2 shows the positive ion mobility spectra for a heated lacquer-coated printed circuit board at temperatures of from  
10 50 to 85°C;

Figure 3 shows the positive ion mobility spectra for a heated lacquer-coated printed circuit board at temperatures of from  
15 85 to 105°C;

Figure 4 shows the negative ion mobility spectra for a resistor heated to 50 to 100°C; and

Figure 5 shows the positive ion mobility spectra for a  
20 resistor heated to 50 to 100°C.

The illustrated device in Figure 1 comprises an inlet system comprising a heated nozzle (1) and a silicon rubber membrane (2). Gas sample is admitted through the inlet system as a  
25 result of the action of a diaphragm pump (3) operated by a motor (4). Sample transfers into an ionisation section (5) where a nickel-63 ion source generates the ions. A pulse of ions (generally about 0.2ms) is admitted into a drift tube section (6) by manipulation of the potentials on a grid  
30 assembly (7). The drift tube (6) is typically about 4cm long with an electric field of 250V/cm. Ions pass to a collector electrode (8), where they are neutralised, generating a current which is passed to a microprocessor (9), which generates a signal, if necessary after amplification. The  
35 signal may be passed to a display assembly (10).



In general ion drift times are less than 20ms, and so spectra may be gathered at the rate of say 50Hz.

#### Example 1

- 5 A lacquer coated printed circuit board was heated from 50 to 105°C in the vicinity of an ion mobility spectrometer that was operational throughout. At the start of the heating process, the positive reactant ion peak (i.e. that produced as a result of the ionisation of air), is the major feature of the
- 10 spectrum (see Figure 2 - trace at the back of the representation). As the printed circuit board was heated, this peak is replaced by an ion of reduced mobility (further to the right in the representation), formed by the reaction of vapour emitted by the board with reactant ions in the
- 15 instrument. This characteristic feature increases in intensity and then falls as a further prominent ion is formed (Figure 3).

#### Example 2

- 20 Example 1 was repeated but this time with a resistor in place of the printed circuit board. In a first experiment, the resistor was heated from 50 to 100°C and in a second experiment, a temperature range of from 90 to 140°C was used. Significant changes in the negative ion spectra (Figures 4 and
- 25 5 respectively) were recorded.

The sensitivity of this technique is clear from this example, as resistors do not generally emit volatile materials.



## Claims

1. A method for detecting gases or vapours emitted from materials under conditions at which there is a risk of the onset of fire, said method comprising sampling gas from the region of the material using an ion mobility spectrometer, detecting the ion peak of volatilised material.
2. A method according to claim 1 which is effected in a data processing or computer facility, a telephone exchange, a space station, or an industrial plant.
3. A method according to claim 1 or claim 2 wherein sampling is effected continuously.
4. A method according to claim 1 or claim 2 wherein sampling is effected at predetermined time intervals.
5. A method according to any one of the preceding claims wherein the ion mobility spectrometer is connected to an alarm system.
6. A method according to claim 5 wherein the alarm is triggered when an ion peak reaches a predetermined intensity level.
7. A method according to claim 5 wherein the alarm is triggered when any ion peak increases significantly over a period of time.
8. A method according to any one of claims 5 to 7 wherein the alarm is triggered when a feature characteristic of thermal degradation is detected.

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9. A method according to any one of the preceding claims wherein the ion mobility spectrometer is set to detect volatile material released from an electrical component.

5 10. A method according to claim 9 wherein the electrical component is a printed circuit board or a resistor.

11. Apparatus for detecting a heightened fire risk in an environment using the method as claimed in any one of claims 1  
10 to 10.

12. An ion mobility spectrometer adapted such that it is able to detect increases in the amounts of gases or vapours emitted from materials present in a particular environment, under  
15 conditions at which there is a heightened risk of the onset of fire.

13. An ion mobility spectrometer for use in a method according to any one of claims 1 to 10.  
20

14. An ion mobility spectrometer when used in a method according to any one of claims 1 to 10.

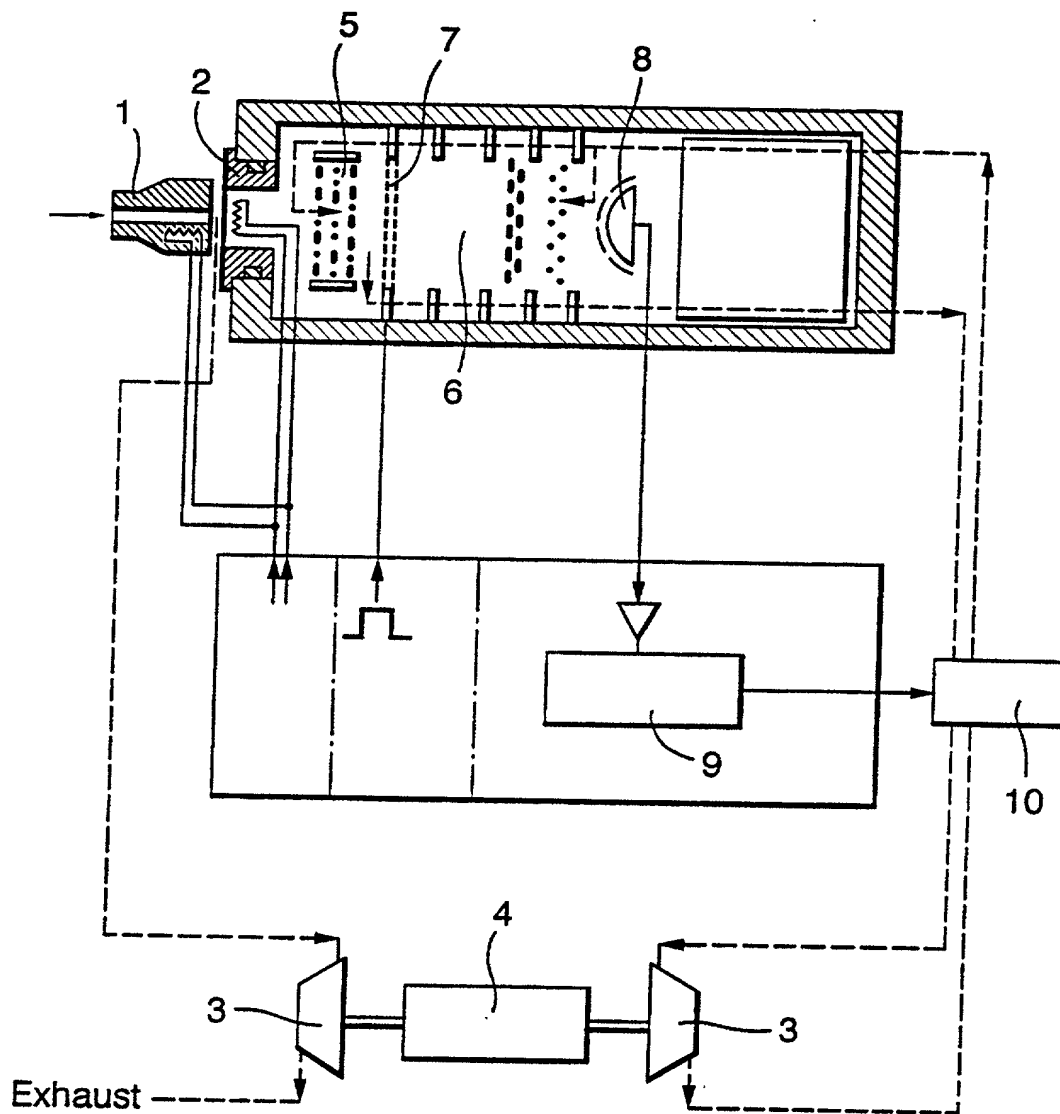
15. The use of an ion mobility spectrometer for the  
25 detection of a heightened risk of fire in an environment.

16. The use according to claim 15 wherein controls of the ion mobility spectrometer are arranged so that it is able to detect increases in the amounts of gases or vapours emitted  
30 from materials present in the environment under conditions at which there is a risk of the onset of fire.



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Fig.1.



Legend

- |                          |   |
|--------------------------|---|
| -----> Pneumatic Circuit |  Sample Ions |
| -----> Electric Circuit  |  Air Ions    |



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Fig.2.

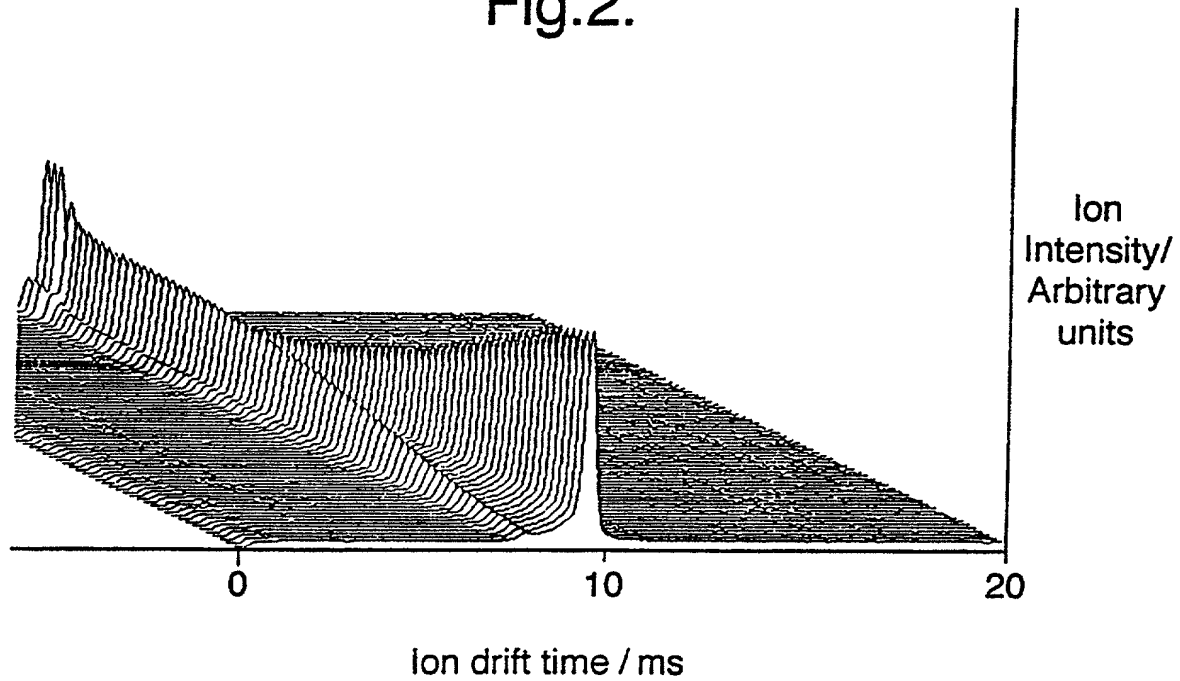
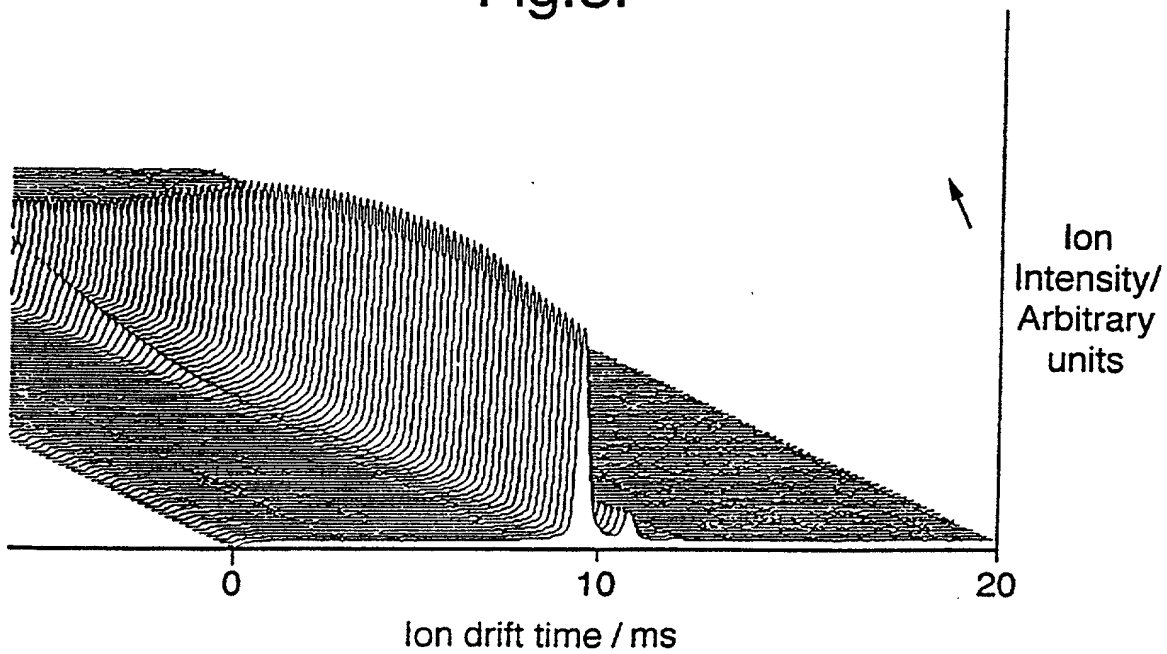


Fig.3.





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Fig.4.

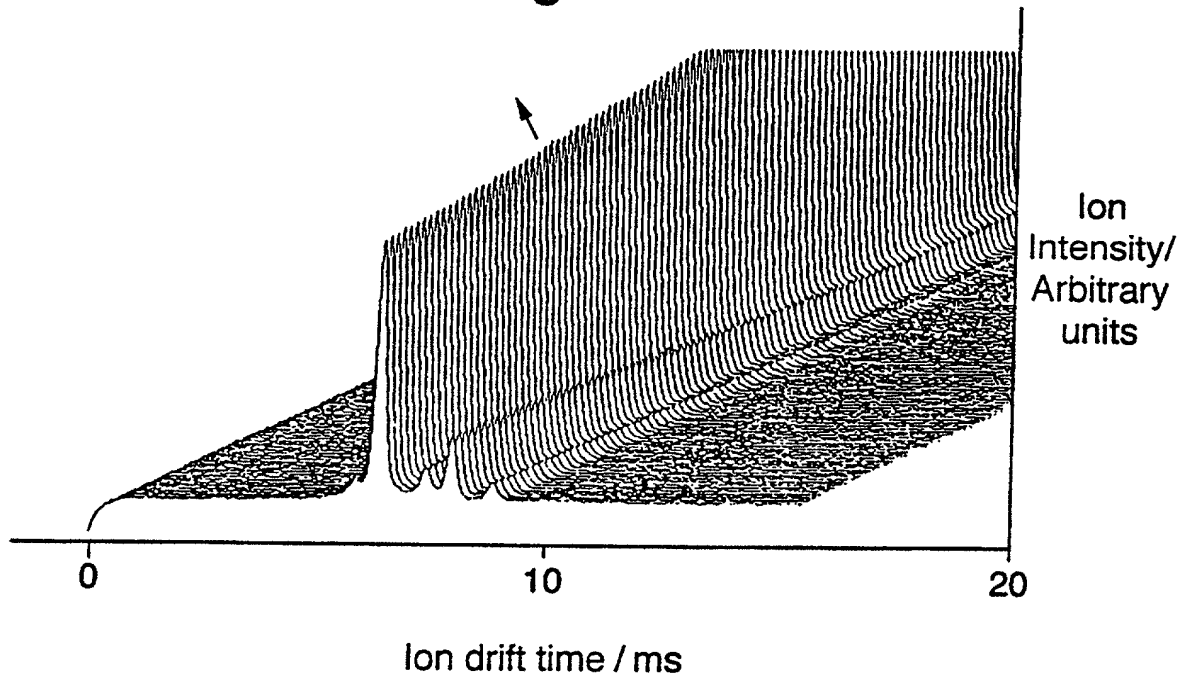
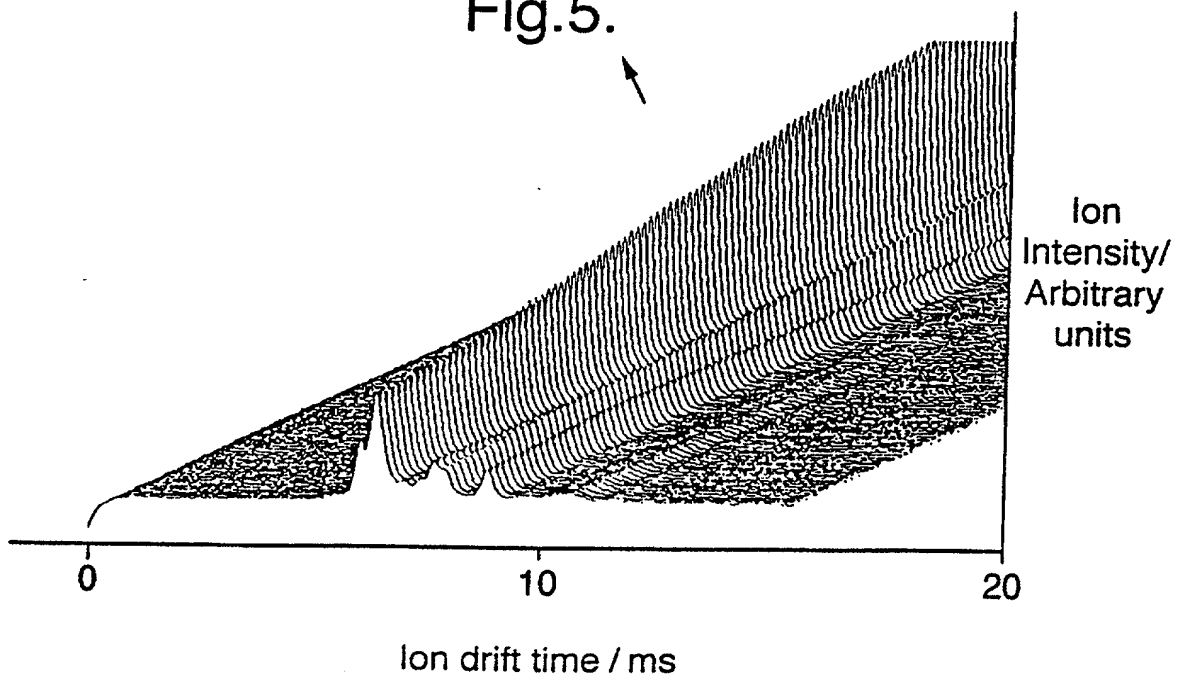


Fig.5.





**DECLARATION FOR PATENT APPLICATION**☒ Original☐ Supplemental☐ Substitute☐ PCT

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below), or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**FIRE DETECTION METHOD****(Title of the Invention)**

the specification of which (check one)

☐ is attached hereto☐ was filed on \_\_\_\_\_ as U. S. Application Serial Number \_\_\_\_\_

☐ was filed as PCT International Application Number PCT/GB00/00210 on 25 January 2000  
and was amended under PCT Article 19 on \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 (a) - (d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified, by checking the box below, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Applications			Priority Claimed		Copy Attached	
Application Number	Country	Foreign Filing Date (MM/DD/YYYY)	YES	NO	YES	NO
9901764.2	GB	28 January 1999	Yes			No

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below and claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application(s) designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:



U.S. Serial No.

For: "

Inventors:

Filed:

Declaration for Patent Application

Page 2

Parent Application Number	Filing Date	Status (Mark Appropriate Column Below)		
		Patented	Pending	Abandoned
PCT/GB00/00210	25 January 2000		Pending	

As a named inventor, I hereby revoke all prior powers and appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

KILPATRICK STOCKTON LLP, Suite 2800, 1100 Peachtree Street, Atlanta, Georgia 30309-4530

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Tiep H. Nguyen	44,465
Michael J. Dimino	44,657
Kristin L. Johnson	44,807
J. Jason Link	44,874
Bambi F. Walters	45,197
J. Michael Boggs	P46,563
Adam E. Crall	P46,646
Kyle M. Globerman	P46,730
Tywanda L. Harris	P46,758
Kristin D. Mallatt	P46,895
Cynthia B. Rothschild	P47,040

I acknowledge the above-listed attorneys and agents and their firm Kilpatrick Stockton LLP represent my employer (if I am an employee and this application has been or will be assigned to my employer) or the entity with which I have contracted (if I am an



Attorney Docket No. \_\_\_\_\_

**DECLARATION FOR PATENT APPLICATION**☒ Original☐ Supplemental☐ Substitute☐ PCT

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below), or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled,

**FIRE DETECTION METHOD**

(Title of the Invention)

the specification of which (check one)

☐ is attached hereto☐ was filed on \_\_\_\_\_ as U. S. Application Serial Number \_\_\_\_\_☐ was filed as PCT International Application Number PCT/GB00/00210 on 25 January 2000

and was amended under PCT Article 19 on \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 (a) - (d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified, by checking the box below, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Applications			Priority Claimed		Copy Attached	
Application Number	Country	Foreign Filing Date (MM/DD/YYYY)	YES	NO	YES	NO
9901764.2	GB	28 January 1999	Yes			No

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below and claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application(s) designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:



Attorney Docket No. \_\_\_\_\_

**DECLARATION FOR PATENT APPLICATION**☒ Original☐ Supplemental☐ Substitute☐ PCT

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below), or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**FIRE DETECTION METHOD**

(Title of the Invention)

the specification of which (check one)

☐ is attached hereto☐ was filed on \_\_\_\_\_ as U. S. Application Serial Number \_\_\_\_\_☐ was filed as PCT International Application Number PCT/GB00/00210 on 25 January 2000  
and was amended under PCT Article 19 on \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 (a) - (d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified, by checking the box below, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed

Prior Foreign Applications			Priority Claimed		Copy Attached	
Application Number	Country	Foreign Filing Date (MM/DD/YYYY)	YES	NO	YES	NO
9901764.2	GB	28 January 1999	Yes			No

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below and claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application(s) designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:



U.S. Serial No.

For: "

Inventors:

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Page 2

Parent Application Number	Filing Date	Status (Mark Appropriate Column Below)		
		Patented	Pending	Abandoned
PCT/GB00/00210	25 January 2000		Pending	

As a named inventor, I hereby revoke all prior powers and appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

KILPATRICK STOCKTON LLP, Suite 2800, 1100 Peachtree Street, Atlanta, Georgia 30309-4530

Attorney and/or Agent	Registration No.
Charles Y. Lackey	22,707
John M. Harrington	25,592
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James L. Ewing, IV	30,630
Charles W. Calkins	31,814
George T. Marcou	33,014
Bernard J. Graves, Jr.	33,239
Dean W. Russell	33,452
Richard T. Peterson	35,320
Charles T. Simmons	35,359
Nora M. Tocups	35,717
Bruce D. Gray	35,799
Theodore R. Harper	35,890
Geoff L. Sutcliffe	36,348
Stephen B. Parker	36,631
Pat Winston Kennedy	36,970
Mitchell G. Stockwell	39,389
Michael J. Turton	40,852
Yoncha L. Kundupoglu	41,130

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J. Steven Gardner	41,772
James J. Bindseil	42,326
Camilla Camp Williams	43,992
Carl B. Massey	44,224
R. Whitney Winston	44,432
John William Ball, Jr.	44,433
Dawn-Marie Bey	44,442
Tiep H. Nguyen	44,465
Michael J. Dimino	44,657
Kristin L. Johnson	44,807
J. Jason Link	44,874
Bambi F. Walters	45,197
J. Michael Boggs	P46,563
Adam E. Crall	P46,646
Kyle M. Globerman	P46,730
Tywanda L. Harris	P46,758
Kristin D. Mallatt	P46,895
Cynthia B. Rothschild	P47,040

I acknowledge the above-listed attorneys and agents and their firm Kilpatrick Stockton LLP represent my employer (if I am an employee and this application has been or will be assigned to my employer) or the entity with which I have contracted (if I am an



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Page 3

independent contractor and this application has been or will be assigned to such entity) and in such cases do not represent me individually. I further acknowledge I have not established, nor will I seek to establish, any personal attorney/client relationship with Kilpatrick Stockton LLP in connection with this application and understand that, should I require legal representation, I will obtain such, at my expense, other than through Kilpatrick Stockton LLP.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of first inventor Brian FOULGER  
Inventor's signature \_\_\_\_\_ Date \_\_\_\_\_  
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Citizenship GB  
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Full name of second inventor James RICHES  
Inventor's signature \_\_\_\_\_ Date \_\_\_\_\_  
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Citizenship GB  
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Full name of second inventor Hilary Roberta BOLLAN  
Inventor's signature *Hilary BOLLAN* Date 8 August 2001  
Residence GB  
Citizenship GB  
Post Office Address Sea Technology Group, Defence Procurement Agency, MOD Abbey Wood, Bristol, BS34 8JH.



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Page 3

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1-02  
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Inventor's signature X B. Foulger

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3-02  
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Inventor's signature \_\_\_\_\_ Date \_\_\_\_\_  
Residence GB  
Citizenship GB  
Post Office Address Dstl, Winfrith Technology Centre, Winfrith, Newburgh, Dorchester, Dorset DT2 8XJ

Full name of second inventor James RICHES  
Inventor's signature X J. Riches Date X 06/08/01  
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Citizenship GB  
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Full name of second inventor Hilary Roberta BOLLAN  
Inventor's signature \_\_\_\_\_ Date \_\_\_\_\_  
Residence GB  
Citizenship GB  
Post Office Address Sea Technology Group, Defence Procurement Agency, MOD Abbey Wood, Bristol, BS34 8JH.



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FORM PTO-1390 (REV. 1-98)		U. S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER 41577/261336
<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371</b>			U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/889,639
INTERNATIONAL APPLICATION NO. PCT/GB00/00210	INTERNATIONAL FILING DATE 25 January 2000 (25.01.00)	PRIORITY DATE CLAIMED 28 January 1999 (28.01.99)	
TITLE OF INVENTION FIRE DETECTION METHOD			
APPLICANT(S) FOR DO/EO/US FOULGER, Brian; RICHES, James; BOLLAN, Hilary Roberta			

Applicants herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

- ☐ This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
- ☒ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.
- ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 37 (b) and PCT Articles 22 and 39(1).
- ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
- ☐ A copy of the International Application as published (35 U.S.C. 371(c)(2))
  - ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
  - ☐ has been transmitted by the International Bureau.
  - ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
- ☐ A translation of the published International Application into English (35 U.S.C. 371(c)(2)).
- ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - ☐ have been transmitted by the International Bureau.
  - ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - ☐ have not been made and will not be made.
- ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
- ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
- ☐ A translation of the International Preliminary Examination Report under PCT Article 36
- ☐ An Information Disclosure Statement under 37 CFR 1.197 and 1.98
- ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
- ☐ A FIRST preliminary amendment.
- ☐ A SECOND or SUBSEQUENT preliminary amendment.
- ☐ A substitute specification.
- ☐ A change of power of attorney and/or address letter.
- ☒ Other items or information:
  - Certification Under 37 CFR 1.10  
 I hereby certify that this document is being mailed to Box PCT, Commissioner for Patents, P. O. Box 2327, Arlington, VA 22202, via "Express Mail Post Office to Addressee" on this 4th day of December, 2001, Express Mail Label No. EL209599865US  
Angela M. Rossi Angela M. Rossi
  - Copy of Notification of Missing Requirements

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